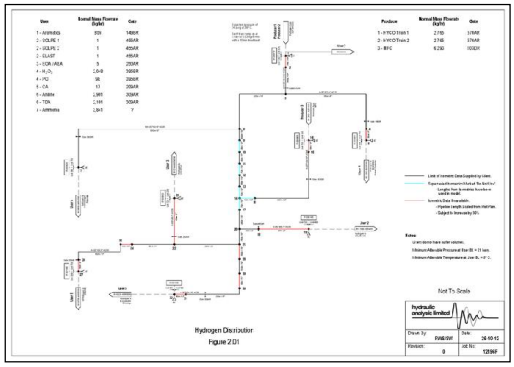
Sadara Chemicals Hydrogen Distribution Network

System	: Hydrogen Distribution
Location	: Saudi Arabia
Scope	: Pipeline Simulation Study
Client	: Fluor / Sadara Chemicals
Study Date	: 2012
Flowrate	: 12,000 kg / hour
Pressure	: 24 barg
Temperature	: 38°C



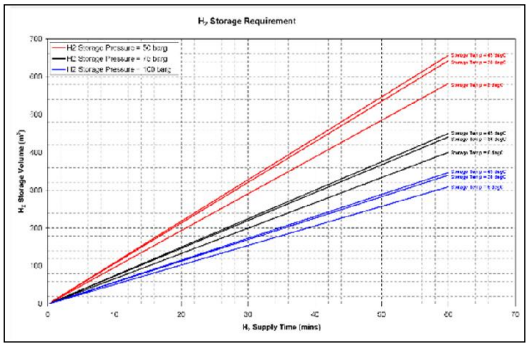
Study Scope

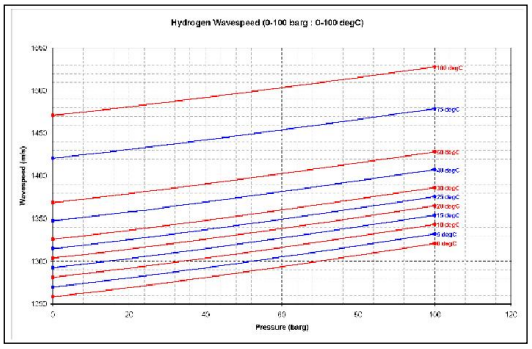
The Sadara Chemical Company (Sadara), is a joint venture between Saudi Aramco and Dow Chemicals to operate a world-scale integrated chemicals complex in Jubail, Saudi Arabia. The Sadara complex was the largest petrochemical facility ever built in a single phase and we were involved with the hydraulic design and modelling of the complete hydrogen network.

The scope of work included modelling the supply, distribution and receipt of hydrogen throughout the site which consists of many kilometres of pipework. The purpose of the study was to simulate the system during normal operation, start-up, changes in supply / delivery flowrates, shutdown, and emergency conditions to determine the pressures and temperatures experienced in the system. The key objectives were to maximise plant availability and to minimise any downtime following an upset event by returning the system to normal operation as soon as safely possible. This included designing and optimising the storage facilities to ensure hydrogen demand could still be met during periods of low production.

The design of hydrogen pipeline facilities presents a unique challenge due to the high wavespeed of the fluid (the speed in which pressure waves travel through the fluid). The wavespeed of natural gas is typically around 450m/s but it can be as high as 1,400 m/s in hydrogen, depending upon the pipeline pressure. Pressure changes in hydrogen pipelines pass through the pipework much faster than in a water pipeline and consequently it can be very difficult maintaining a pressurised system if there is a reduction in supply pressure. A hydrogen pipeline will also depressurise must faster than a natural gas, oil or water pipeline due to the low density and high wavespeed of the fluid. The pressure control stations needed to have very tight control bands to avoid passing high pressures into lower rated pipework although the challenge with designing and installing responsive pressure control equipment is to then avoid introducing controller instabilities. It can also take much longer to re-pack a hydrogen pipeline following a supply pressure drop.

Hydraulic Analysis continue to support Sadara with pipeline simulation modelling through providing VariSim™ software licenses.





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